To Protect Our Environment

This special issue of the Journal is replete with articles by Hawaii's own, indicating the interest of the medical profession in our fragile environment in terms of how it affects the health of our people.

Steve Moser from Maui, recipient of the A.H. Robins award by the HMA for being the Physician of the Year in 1985, is the issue editor. Kudos is due him for working hard to assemble the manuscripts (should I say dragging them out of their authors?). They cover the entire spectrum — almost. It has taken nearly a year.

This issue should stand a long time as an essential reference source. It will be a valuable learning experience for every physician in Hawaii.

J I Frederick Reppun MD
Editor

The medical issue of our polluted environment

Hawaii has a reputation for being one of the least polluted states in the United States. It enjoys this distinction because of its location in the middle of the largest ocean in the world, its relatively recent discovery, its largely agricultural history, and its immense natural beauty. With the introduction of Western civilization, however, and more recently the massive growth of population, both residential and visitor, Hawaii's natural environment and the previous unspoken guarantee of a safe and healthful environment are being threatened.

In some cases, old accepted practices, such as the burning of sugarcane, are running up against the concerns of newcomers who are settling in areas in close proximity to cane fields. In other cases, the continued use of pesticides may threaten the purity of aquifers whose water is necessary for the future growth of the population, as we have seen at Mililani on Oahu.

Technologies new to Hawaii, such as hazardous waste incineration and geothermal power development, may present problems due to our unique atmospheric and geologic conditions. Old technologies, such as the gasoline-powered vehicle and the landfill, are becoming more serious problems simply because of the great increase in the number of vehicles and the enormous amount of waste generated by the people who are settling here. Sewage disposal is becoming a concern on all of the islands as present capacity is approached, again because of uncontrolled population growth.

The presence of the military in the Hawaiian Islands has always presented some challenges to the environment. Unexploded ordnance has made many large tracts of land unreclaimable. Anti-fouling paint may threaten the marine environment. Large stockpiles of nuclear weapons exist in the vicinity of Pearl Harbor. Newer developments, such as the launching of large rockets from the Kauai Barking Sands Missile Range and from the proposed space-port in Ka'u on the Big Island, raise environmental concerns as to the safety of rocket fuels. The recent selection of Schofield Barracks as a "Superfund" cleanup site raises concerns because of possible serious groundwater contamination by the carcinogen trichloroethane; it is but one example of how pollution may occur in Hawaii.

Even natural phenomena, such as volcanic emissions and the flow of lava into the sea, may present new problems as the pressure of population in areas in close proximity is occurring. Natural phenomena typically fall beyond the purview of the state regulatory agencies. However, since lead was found to be leaching into the drinking water of Big Island catchment systems due to acid rain two years ago, the State, after performing a limited study of the problem, has yet to regulate the building of these water systems so that the problem can be prevented.

This issue of the *Journal* represents a limited attempt to present some of the main environmental health concerns in the State of Hawaii. The practicing physician may well ask what place such concerns have in a journal of general medical readership. Why should a busy clinician, obstetrician, pathologist or radiologist be concerned with pesticides in groundwater, with air pollution? We hope to provide some of the many answers.

Beside the obvious answer that environmental contaminants may cause a variety of serious human diseases, perhaps less well-known is the fact that physicians are the primary detectors of environmentally caused illness. New laws mandating the reporting of diseases related to the toxic effects of pesticide and heavy metal have sprung up around the country, most recently here in Hawaii. Physicians will be aiding the governmental departments of health by diagnosing, treating and reporting these disorders. Such responsibilities can no longer be relegated to "occupational medicine" specialists. The environmental contamination reaches out beyond the workplace.

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In addition, because of inadequate staffing and funding of health departments, physicians must become advocates on behalf of their patients in dealing with the State, with industry and with agriculture, so that prevention of environmental illness can become a reality. Just as handwashing will stem a pseudomonas epidemic in the intensive care unit of a hospital, and a low cholesterol diet and exercise will mitigate against coronary artery disease, so will lobbying and advocacy on behalf of patients by their personal physicians potentially prevent the chance that an infant will be born with some rare birth defect which, while statistically unlikely, would prove very unfortunate for the particular individual who is afflicted.

Recently, we have had to acknowledge one of the more sinister aspects of environmental medicine, and that is the reality of corporate lying and subterfuge. This has been brought forcefully home in the past few months with the startling revelations by the Environmental Protection Agency (EPA) regarding Monsanto's pervasive and systematic falsification of data and suppression of information regarding the carcinogenicity of dioxin and its widespread high-level contamination of Monsanto's most popular products[1].

In a law suit against the company in 1985, investigators, who had published a study documenting the cancer rates resulting from a dioxin spill at one of the Monsanto factories in 1949, acknowledged that they had purposefully omitted 5 cancers deaths from the exposed group and put 4 cancer patients from the exposed group into the control group, thereby being able to report no significant effect on cancer rates from a massive dioxin exposure. What had been proven to be a highly significant carcinogenic effect (50% increase in the dioxin exposed group) was fraudulently erased for reasons that one can only speculate upon.

Tragically, on the basis of this well-documented study, the EPA subsequently dismissed other less well-documented studies with lesser degrees of exposure, and felt safe in telling the world that dioxins did not cause cancer. Data on long-term psychoneuroses in the exposed group were similarly falsified and buried.

Testimony during the court case revealed in addition that commonly used Monsanto products, such as Lysol (made from a Monsanto product), pentachlorophenol and Santophen were heavily contaminated with dioxins for up to 30 years, with full knowledge of the company. They did not tell their employees, their customers nor the EPA about the contamination. Meanwhile, they knew of the falsification of the dioxin cancer study.

It is this haunting spectre of corporate malice aforethought that must make even the most sanguine of us concerned about the process by which our government agencies, especially the EPA, purportedly protects us. At this very moment, the HMA is evaluating the response to a Freedom of Information Act request that was filed with the EPA last year over the original Monsanto studies done for the registration of the commonly used roadside and garden herbicide glyphosate (Roundup or Rodeo).

All the basic scientific studies dealing with the mutagenicity, carcigenicity and teratogenicity of the product have been performed by the manufacturer or its consultants. We are told that this product is entirely safe, and we use it without restraint. Given the dioxin debacle, however, we must acknowledge a little trepidation concerning this ubiquitous product.

We fully acknowledge that environmental medicine is an area of great controversy in this State and around the world. The tradeoff between economic realities and environmental purity will always be a balancing act. Nonetheless, the public is finally beginning to perceive the importance of maintaining and preserving the earth from chemical degradation, because of a growing consciousness that human life is earth-bound and that what happens to our water, air and land will eventually affect our bodies and, in the end, our survival.

I have taken the liberty of commenting on each of the articles that we have accepted for publication in this special issue of the *Journal*.

1. Au. Groundwater contamination in Hawaii

Hawaii has the longest growing season in the nation. Decades of intensive sugar and pineapple monoculture have necessitated year-round use of pesticides, which increases on a yearly basis as a result of the emergence of resistant insects and weeds.

Although drinking water wells are still relatively uncontaminated, constant agricultural spraying has already proven to be a problem because of the trend, as the population grows, of developing agricultural land for housing, with the concomitant need for more water.

Mililani found its erstwhile agricultural water contaminated with unacceptably high levels of toxins and was forced to construct and use an expensive purification plant.

Other areas of Oahu and on the other islands stand on the verge of developing agricultural lands and attempting to find potable water for the new residents. Nitrates from chemical fertilizers and other sources are present in Hawaiian agricultural wells to a dangerous degree should these wells ever be needed for human use[2].

The practice of risk assessment, while an excellent method for evaluating the carcinogenic potential of a single chemical, carries many caveats. The first is that risk assessment does not, and really cannot, evaluate multiple chemical exposures. The water we drink is a "soup" of chemicals, all at very low doses, it is true, but all with their own effects on living organisms. Whether these effects are additive, synergistic, or neither, is almost always unknown.

Secondly, there are hundreds of thousands of chemicals currently registered for use in this country, and most of them have not been studied enough to do an adequate assessment of risk. Of the ones that have been studied, we are all too often forced to rely on "...more protective..." (author's words) studies on which to base our assessments.

Thirdly, in the State of Hawaii, the agricultural industry is not required to tell the State which chemicals they are using on the crops. This of course makes it difficult to determine which ones to look for in the water, and thereby to assess risk.

The State has just completed its revision of groundwater protection strategy[3]. This document is an example of the extremely difficult choices that must be made in regard to

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which waters must be protected, to what degree, and who will have the ultimate responsibility. How well this document will serve as a template to protect our groundwater from further contamination remains to be seen.

2. Maskarinec. Environmental epidemiology

As an empirical science, environmental epidemiology faces some great hurdles, some of them alluded to by the author. The main problems revolve around the ability to draw conclusions from data that these studies generate and depend upon. If the dose of a contaminant is large, and the population at risk is large, then a well-designed study should be able to draw fairly firm conclusions as to whether the contaminant is associated with an adverse effect. If the dose is small and the at-risk group is small, almost no conclusions can be drawn from even the best designed study. Unfortunately most situations of contamination in the real world fit into the latter scenario.

A second hurdle results from the lack of good epidemiologic databases. For instance, the Hawaii Tumor Registry is an excellent registry for documenting types of tumors in the State on the basis of survival rates, age and sex. However, because it lacks any occupational, habit, or residence data, it is practically useless for examining cancer clusters, cancer relation to industrial (or agricultural) exposure, or habit-related cancers. Attempts to upgrade the Registry to include such information gathering have been unsuccessful. Similarly, bills to fund a statewide, birth-defects-monitoring program have repeatedly failed at the Legislature, despite strong community and HMA support.

The third, and perhaps greatest hurdle in declaring environmental epidemiology a bona fide science, is our great difficulty in converting positive findings into public and industry policy. When correlations are found between contaminants and health effects, such information is often met with extreme skepticism in the governmental and industrial decision-making circles. More studies are called for; administrations change; the public tends to forget.

We still live in a society where the proof of the damage, actual or potential, is on the victim and not on the perpetrator. The victim must usually demonstrate that his injury was caused, beyond a reasonable doubt, by the substance in question. When such proof is lacking, either because of inability to quantify exposure levels, or because of the enormous lacunae in the scientific research on most of the chemicals that have been approved, there is very little that can be done to obtain recompense or prevent recurrence. This state of affairs must change, and in some places such as California, steps are being taken to rectify this inequity.

3. Grimes. Fire fighters

Perhaps the most fascinating finding in this brief Proportionate Mortality Ratio study is that fire fighters have much less lung disease than the average population of nonfire fighters. Fire fighters are trained to wear appropriate masks in fires in which toxic combustion products may be present. Is it a likely possibility that firefighters have a lower prevalence of cigarette smoking?

4. Kodama. UH Occupational-health training

It is good to know that an interested physician can take course work in public health or occupational medicine at the University of Hawaii in pursuit of certification requirements without having to leave the State.

It is unfortunate that the State does not have a baccalaureate program in this growing field, since there is a growing need for such a learning center in Hawaii. There needs to be a much stronger program for training medical students in environmental and occupational medicine. These specialties were largely lacking in our medical school training, and it is becoming evident that they enter into our daily medical practice at many levels and in relation to many disease processes. Which one of us is capable of taking a complete occupational and exposure history, need I ask?

5. Wiebe. Lead poisoning

A little more detail is necessary for readers to understand the scope of the problem of lead in catchment drinking water on the island of Hawaii, and indeed on other islands. There are about 7,000 residences on the Big Island which supply drinking water from catchment systems. The at-risk population of adults and children on the Big Island is substantial. Of the conservatively estimated 28,000 individuals, possibly one-half the number are children, with a substantial number of these under age 6. A major methodological problem with the survey done in 1988 is that it included mainly those concerned and aware families who volunteered to have their blood tested. There is a high likelihood that this "worried well" group had stopped drinking the catchment water several months prior to the blood testing. These possibilities create a bias that would tend to underestimate the true number of individuals with elevated blood levels.

Of even greater concern is that the State is taking very little initiative to prevent contamination of catchment systems by regulating and inspecting their construction. Correspondence by the HMA to the various state and county regulatory agencies last year revealed that no agency is willing to take responsibility for regulating and inspecting private water-catchment systems.[4] Information on safe building materials and practices is occasionally available, but only upon request. A bill that would have mandated the State Department of Health (DoH) to regulate and inspect catchment systems was opposed by it and was defeated in the 1990 Legislature. I have been told by residents that hardware stores on the island of Hawaii are still selling lead-containing materials for catchment systems. Also, there is no ongoing screening for lead in the State at this time, though the DoH proposes to do so soon. There has been no official monitoring of the use of state-supplied, "spigot-water" to determine whether it is being used in lieu of home catchment-water for drinking.

The expansion of geothermal activities on the Big Island has the potential for causing acid rain in the Puna area, an area that does not now experience this phenomenon, but is heavily reliant on catchment water. Pediatricians in the State should be aware of the potential for low-level lead-toxicity in children; physicians should be familiar with the American Academy of Pediatrics "Statement on Childhood Lead Poisoning",

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and should test for lead-levels in selected children.

6. Hallenborg. Medical consequences of acute high altitude exposure

Although not truly a toxic environmental condition, high altitude sickness is an "environmental" illness that is not generally recognized in Hawaii. Hundreds of tourists a day board buses and rental cars for the long drive to the summit of Haleakala. Many of these people are older and debilitated. There have been numerous documented episodes of congestive heart failure, angina and myocardial infarction resulting from even relatively brief exposures to the thin cold air of the summit in patients, most of whom had emphysema or coronary artery disease; some were not aware that they had such a preexisting problem.

It is unfortunate that the tourist industry in Hawaii has not seen fit to take the responsibility to warn potential victims of this unsuspected pitfall. As yet, the State has also neglected to post warnings or provide needed resuscitative equipment at the summit.

For that matter, there are several potentially hazardous environmental conditions that exist in this State in high concentration, such as beaches with pounding shorebreaks and strong riptides, etc.

7. Hallenborg et al. Air pollution — asbestos, cane, VOG

This is a basic review of the existing literature dealing with the known health effects of asbestos, sugarcane burning and VOG. While asbestos has been well-studied over the years, and VOG is primarily a problem localized to the Big Island community downwind from the volcano, sugarcane burning is ubiquitous in the Islands and has become the subject of a great deal of controversy as more people move to Hawaii who are not acquainted with this practice. Expectations of a pristine environment are challenged by this daily practice. Questions of nuisance and aesthetic displeasure versus significant health risk become more important as habitations encroach on agricultural areas previously devoted to sugar around the Islands.

A primary concern among researchers and environmentalists is whether the biogenic silica fibers present in the sugarcane and sugarcane smoke present a health risk, such as has been found to exist with the similarly shaped-and-sized fibers of asbestos. This paper discusses the research done in this area.

One way that has been suggested to solve the two major problems of adverse effects on air quality by open field burning and dependency of the State on foreign oil has been to retool the sugar mills to burn not only oil and coal, but raw sugarcane as well. This biomass would be a much cleaner source of fuel than either coal or oil. The capital for this conversion for one mill (HC&S on Maui) has been estimated as about $32 million in 1986, but as fossil fuel prices rise, this home-grown source of energy might rapidly pay for itself.

When considering that the State in the last two years has lent $20 million to sugar companies on Hawaii to keep them solvent, a joint venture to underwrite this health ensuring and economically prudent conversion would be welcome.

8. Baker. Heptachlor in milk in Hawaii

This paper provides a brief overview of the the scope of the heptachlor contamination problem in Hawaii and the studies that have been done and those proposed. What is clear is that the State did not have the public health or academic resources at the time of the contamination in order to deal with an environmental problem of this magnitude.

The studies already done, in general, lacked impact because of inadequate individual exposure assessment, biases involving lack of consideration with regard to ethnicity when evaluating milk consumption, and self-selection of milk donors.

Perhaps the most difficult aspect of studying this sort of contamination is the nature of the effects that are anticipated from such low-level exposure as well as subtle neurologic, immunologic and carcinogenic effects that may occur decades after the exposure. Maintaining records on an adequate number of subjects to give the study power will be difficult at best. Fortunately for the researchers, but perhaps not for the subjects, heptachlor is known to remain in adipose tissue indefinitely, thereby giving validity to measuring levels now, and extrapolating back to the exposure levels, thus providing the possibility of correlating levels of exposure with outcomes.

In the present era of medicine's general consternation with regard to liability and the legal profession in general, we must mention that, without a dedicated and capable lawyer working with an independent motivated researcher who were willing to take on this very difficult and complex case for the sake of children who were innocently exposed, the substantial amount of money that it takes to do the necessary scientific research would never have been available.

The $5 million award was placed into a fund to set up the Hawaii Heptachlor Research and Education Foundation, which was composed of a hand-picked group of experts renowned in the field. These investigators, after evaluating all of the available studies, reviewed proposals submitted for further research and chose the most worthy for funding out of the settlement monies. Such exemplary litigation should serve as a model for the way in which the legal profession can benefit both victims and the public interest in a community which, for whatever reasons, cannot provide expertise in such matters.

On the larger issue of pesticide residues in food, the State of Hawaii is in line with the rest of the country in its inability to test for more than a handful of pesticides and a token number of food items. The State is aware of the problem as outlined by the Office of Environmental Quality Control several years ago, but inadequate staffing and funding have prevented the State from instituting more than minimal testing.[5]

This is a potentially growing problem because of the increasing amount of foreign produce being imported into the United States from Third World countries. It has been the practice of many large pesticide manufacturers to "dump" pesticides banned for use in this country, into foreign countries whose contaminated produce then comes back to us across our borders. Of perhaps greater concern, reports from Mexico indicate that the use of these carcinogens and mutagens by unsuspecting and unprotected field workers has resulted in higher incidences of cancer and birth defects among them.

This is a shameful legacy of our doing. There is ample room for the medical community to become more active in rectifying these inequities and for calling for adequate testing of the foods we buy.

9. Tabrah. Electromagnetic health effects

The author's call for a technical advisory group to assist the DoH in the evaluation of EMF issues seems very cogent in our State that has a concentrated population that has expanded rapidly and has centralized communications facilities. The military is no longer capable of isolating its powerful communications equipment and keeping it far from human habitation; conflicts, therefore, are inevitable. The DoH is even now investigating a possible cluster of leukemia on the Waianae coast near the large ULF transmitter there.

The State has very little in-house expertise in the area of electromagnetic irradiation, and the call for up-to-date monitoring equipment is welcomed. Meanwhile, until further "proof" of hazard or safety is forthcoming, there is enough epidemiologic evidence to suggest that some electromagnetic fields may be carcinogenic. Until we have harder information (which will be hard to get), the regulators should err on the side of public safety in allowing the siting of new electromagnetic sources and power lines, and should avoid permitting development of human habitation in close proximity to existing installations.

Steven M. Moser MD
Special issue editor

FOOTNOTES TO HMA ENVIRONMENTAL ISSUE EDITORIAL COMMENTS

1. EPA Memorandum, 2/23/90. Subject: Newly Revealed Fraud by Monsanto in an Epidemiological Study Used by EPA to Assess Human Health Effects from Dioxins: From Cate Jenkins (Waste Characterization Branch, Characterization and Assessment Division); To Raymond C. Loehr (Chair, Executive Committee, Science Advisory Board, Office of the Administrator).
2. Lukens JN, "The Legacy of Well-Water Methemoglobinemia," *Journal of the American Medical Association*, 257:20, 1987, pp. 2793-2795.
3. *Hawaii Ground Water Quality Protection Strategy*, Hawaii State Department of Health, March 12, 1990.
4. Correspondence on file, HMA Toxic Agents Committee, 1989.
5. "Management and Program Audit of the Environmental Protection and Health Services Division of the Department of Health: A Report to the Governor and the Legislature of the State of Hawaii," Report No. 87-16, February 1987, pp. 54-64.

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Council Capers

January 11, 1991

The HMA Council met on January 11, 1991 for its first meeting of the New Year. Since its incorporation in 1856, the HMA representatives have met in various places, but only four years ago, or after 130 years of existence, the meeting was again held in a "home" of its own, on 1360 South Beretania Street. Needless to say, you are welcome anytime for business or respite.

Chowhound . . . Dr. John Spangler, who must be on a diet, was amazed at my heaping plate of delicious Korean food. El Presidente John McDonnell was punctual and called the meeting to order.

Head Count: Dr. Andy Don reported that total membership of HMA is 1,810, but there was an increase in full-dues-paying members in the Honolulu County. Sad to report that Maui County had a drop of 4 members from a total of 130. The first two purposes of the HMA are to represent the medical profession and to provide information related to medicine. Since the HMA represents the medical profession, shouldn't there be more than 65% of physicians who belong to their organization?

Money . . . Money . . . Dr. Jeanette Chang, the best-looking member of the Executive Committee, reported on the treasury, which is in good shape. A minor adjustment of the Honolulu County budget was made, with revision of the HMA budget.

DHS Survey . . . Only 252 responses were noted. About 50% of the response had overhead between 50-70%. In 1985, 75% of the respondents would accept new DHS patients. Now only 56% would accept new DHS patients.

HMSA . . . A long and serious presentation was made by our legal counsel, Vernon Char, and his associate. It was reported that the Administrative Operating Procedures were changed in 1985 and again in 1991. It was reported that the usual charge is the charge for a procedure for 9 months of the prior year. Customary was defined as the charge recorded by 90% of physicians for a similar procedure. HMSA Economic Index is derived by the increase in the Honolulu Consumer Price Index (CPI), capital account, change in per capita income divided by three. This will determine the eligible charge allowed. Diagnostic procedure amounts were up 14% this year, 9% last year. A more detailed and informative report will follow from HMA.

Tip Of The Month: Try the Rib Eye Steak at the Halimaile General Store. Wonderful!

Denis J. Fu, MD
Councillor from Maui